

BREEDING BIOLOGY OF THE SOUTHERN CROW-PHEASANT *CENTROPUS SINENSIS PARROTI* STRESEMANN (AVES : CUCULIDAE) AT POINT CALIMERE, TAMIL NADU¹

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(With four text-figures)

The breeding season extends from November to May. The size of the territory varied from 0.9 to 7.2 ha with a mean of 3.8 ha. Egg laying intensified after heavy rains. The nest is globular in shape with a lateral entrance and is made up of twigs, aerial roots and leaves. Altogether 56 nest materials were identified. Both sexes take part in the nesting activity. The preferred nesting height in the village habitat was 4-5 m, but in the forest, it is between 3-4 m. The eggs are chalky white in colour. Average size of 30 eggs measured were: length 34.8 ± 1.76 mm, breadth 28.2 ± 1.23 mm and weight 14.9 ± 1.87 g. The clutch size varied from 1 to 4 eggs with a mean clutch size of 2.6 ± 0.75 . Incubation period is 15 to 16 days. It takes 18-22 days for the chicks to fledge. Both sexes take care of the young. The hatching, fledging and brood success were observed to be 77.1%, 97.3% and 66.7% respectively for the two seasons between 1987-1989.

INTRODUCTION

The southern crow-pheasant *Centropus sinensis parroti* is a resident bird at Point Calimere in Tamil Nadu. Its breeding biology has not been studied in detail. However, a note on the common crow-pheasant *Centropus sinensis sinensis* from a single nest is available (Dhindsa and Toor 1981). Some information on breeding records of the Southern crow-pheasant in different localities in India were given by Hume (1890), Gill (1924), Baker (1927, 1934), Whistler and Kinnear (1934), D'Abreu (1935), Ali and Whistler (1936), Ali and Abdulali (1938) and Ali (1954). The present study describes the breeding biology of the southern crow-pheasant in detail. This study formed part of an investigation into the ecology of this species carried out at Point Calimere (Natarajan 1990).

STUDY AREA AND METHODS

The studies were carried out at Point Calimere Wildlife Sanctuary (10° 18'N, 79°51'E) Nagapattinam Quaid-e-Milleth District, Tamil Nadu

and the adjoining villages of Kodikkarai and Kodikkadu. The sanctuary has an area of 2401 ha. Intensive studies were carried out (in an area of 337 ha) in the two villages from 1986 to 1989. Observations were difficult in the very dense vegetation of the forest.

During 1988, six different breeding territories in Kodikkarai village were studied. Sightings of breeding pairs were marked on a map and their territorial areas were calculated following Odum and Kuenzler (1955).

From 1986 to 1989, nest survey was carried out in the village areas and in the forest during three breeding seasons. A total of 34 new nests were recorded. Among these, 21 nests in the village area were continuously watched to determine clutch-size, incubation, hatching success, fledging success and breeding success between the years 1987-1989. The incubation rhythm was observed daily in one of the nests continuously from 0600 to 1800 hrs. The time of each bird arriving at the nest and leaving were noted, and percentage was calculated. Two nests were monitored during the nestling period. Observations were made from dawn to dusk, from egg laying up to the time the nestlings fledged. Four nests were regularly inspected to record growth rate of nestlings. The chicks were colour marked before

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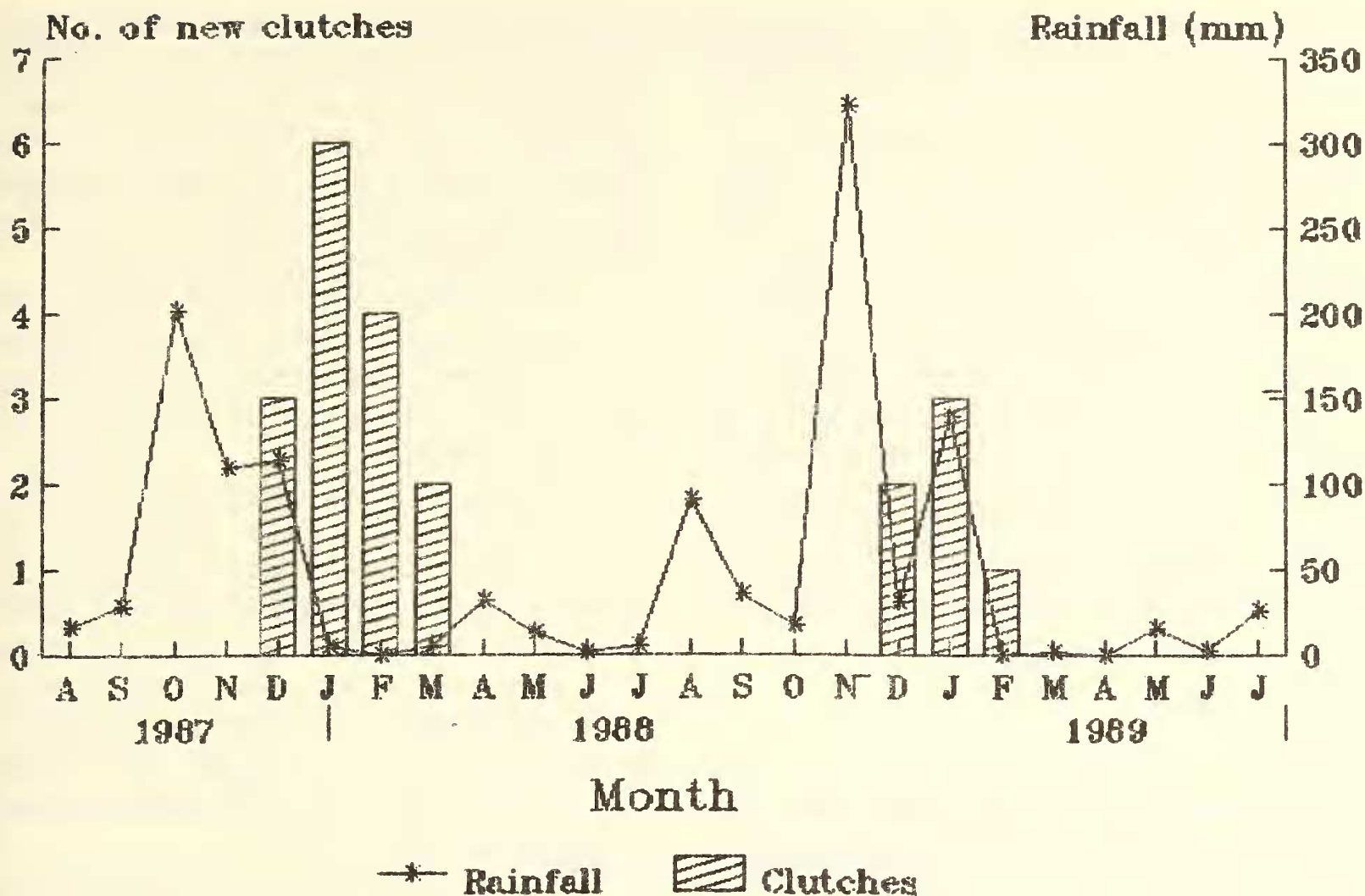


Fig. 1. Number of new clutches in relation to rainfall (1987-1989)

fledging. After breeding was completed, the nests were collected to identify their components.

RESULTS AND DISCUSSION

Breeding season

At Point Calimere the crow-pheasant raises only a single brood during the season extending from November to May. Egg laying was recorded from December to March and it intensified after heavy rains (Fig. 1).

Territory

The breeding pair occupy a well defined area defended by both the parents. The size of the territory varied from 0.9 to 7.2 ha ($n=6$) with a mean of 3.8 ha. In the crow-pheasant, nests were sometimes found in the subsequent season on the

same nesting tree, or on a nearby tree. Other pairs entering this territory were threatened using the harsh *k'wiss* call. Birds such as house crow *Corvus splendens*, jungle crow *Corvus macrorhynchos*, shikra *Accipiter badius*, and brahminy kite *Haliastur indus* were tolerated in the territory, but not on the nesting tree. The *coop-coop-coop* call by which the ownership of the territory was advertised was also used to threaten intruders and keep them away. This type of call was heard frequently throughout the breeding season.

Courtship and pair formation

Display leading to mating was observed twice. In the first instance the male arrived with a frog in its bill and hopped along with the female on the branches of a neem tree *Azadirachta indica*. The female then glided from the tree to the ground and ran for a short distance with wings partly open and

vibrating, uttering a harsh cry: *ske-e-e-a-aw* similar to the call of the common crow-pheasant (Briggs 1931). The male and female then flew up to the neem tree and continued to hop from branch to branch, and then mounted and copulated three times. After copulation the male ate the frog without sharing it with the female. In another instance a male was seen feeding the female during copulation.

During courtship display, the crow pheasant females sometime produced *tch-truu, tch-truu* call (a call usually produced by the juveniles while foraging with their parents) on seeing the male carrying food. Henry, as cited by Ali and Ripley (1983), noted during courtship a curious sound *djoonk* - like a stone dropped into deep water, or a tight cork drawn from an empty bottle. Such a call was not recorded during this study.

The nest

While searching for a new nest-site, the crow-pheasant hops from branch to branch, sits on a perch and calls, which is responded to by its partner. Sometimes, both sexes examine the site inside the thicket. In the beginning, the construction is slow but it accelerates before completion of the nest. Both sexes take part in nest building. Dhindsa and Toor (1981) recorded on the basis of observation at a single nest that the common crow-pheasant completed its nest within three days. During the present study, observations on two nests showed that one nest was constructed in seven days and eggs laid before completing the nest. In the second nest, a pair constructed a nest for about eight days, but abandoned it before completion due to human disturbance. At this nest, the male was observed, during a peak construction day, to visit the nest 35 times and to spend a total (of all trips) of 75 minutes in nest construction. The female came to the nest six times and spent only 10 minutes on the construction of the nest. Mostly the partners bring the nesting material from nearby trees or picked off from the ground or pulled from vegetation. The twigs or other material which could not be taken to the nest were left on the nesting tree. The crow-

pheasant prefers thorny plants in which to build. Out of 45 nests studied, 28 (62.2%) were found on thorny plants, the rest on thornless plants, where the canopy was covered with climbers such as *Tinospora cordifolia*, *Rivea hypocrateriformis*, and *Mucuna pruriens*. These climbers protect the nest from direct sunlight and exposure to predators.

Out of 38 nests studied in the villages, nests were most frequently located in *Prosopis chilensis* (23.7%), followed by *Bamboo* sp. (18.4%). Seven nests were located in the forest, three of which were on *Zizyphus oenopia*.

Among the 45 nests studied, 75.6% (34) were placed in the periphery of the nesting tree and 24.4% were located in the centre of the canopy. In the villages the maximum number of nests were located between 4-5 m (34.2%) height, but in the forest 71.4% of the nests were located at heights between 3-4 m. In the village two nests were noticed on *Borassus flabellifer* (covered with *Rivea hypocrateriformis*) at a height of 9.6 m and one nest on *Tamarindus indica* at 10.7 m.

In the forest the height of location of the nest was less than that of the nests found in the village area. In the village, the birds preferred to place the nests higher, which may have been due to the sparse vegetation.

The crow-pheasant uses twigs, stems, leaves, roots of various plants for nest construction. 56 nest materials were identified. Of the 36 nests analysed, the maximum used nest material was strips of fronds of *Cocos nucifera* (1319) with a mean of 36.6 number per nest followed by stem and aerial root of *Tinospora cordifolia* (839) with a mean of 23.3, and stem of *Tylophora indica* (706) with a mean of 19.6 number per nest. Among the nesting materials the longest was the aerial root of *Tinospora cordifolia* (mean length 110.4 cm) followed by the aerial root of *Cissus quadrangularis* (88.5 cm), stem of *Boerhaavia diffusa* (68.3 cm), strips of fronds of *Cocos nucifera* (61.2 cm) and *Borassus flabellifer* (43.3 cm).

The crow-pheasant builds a globular domed nest with a lateral entrance. However, some nests were deep and cup-like in shape. The nest dimension

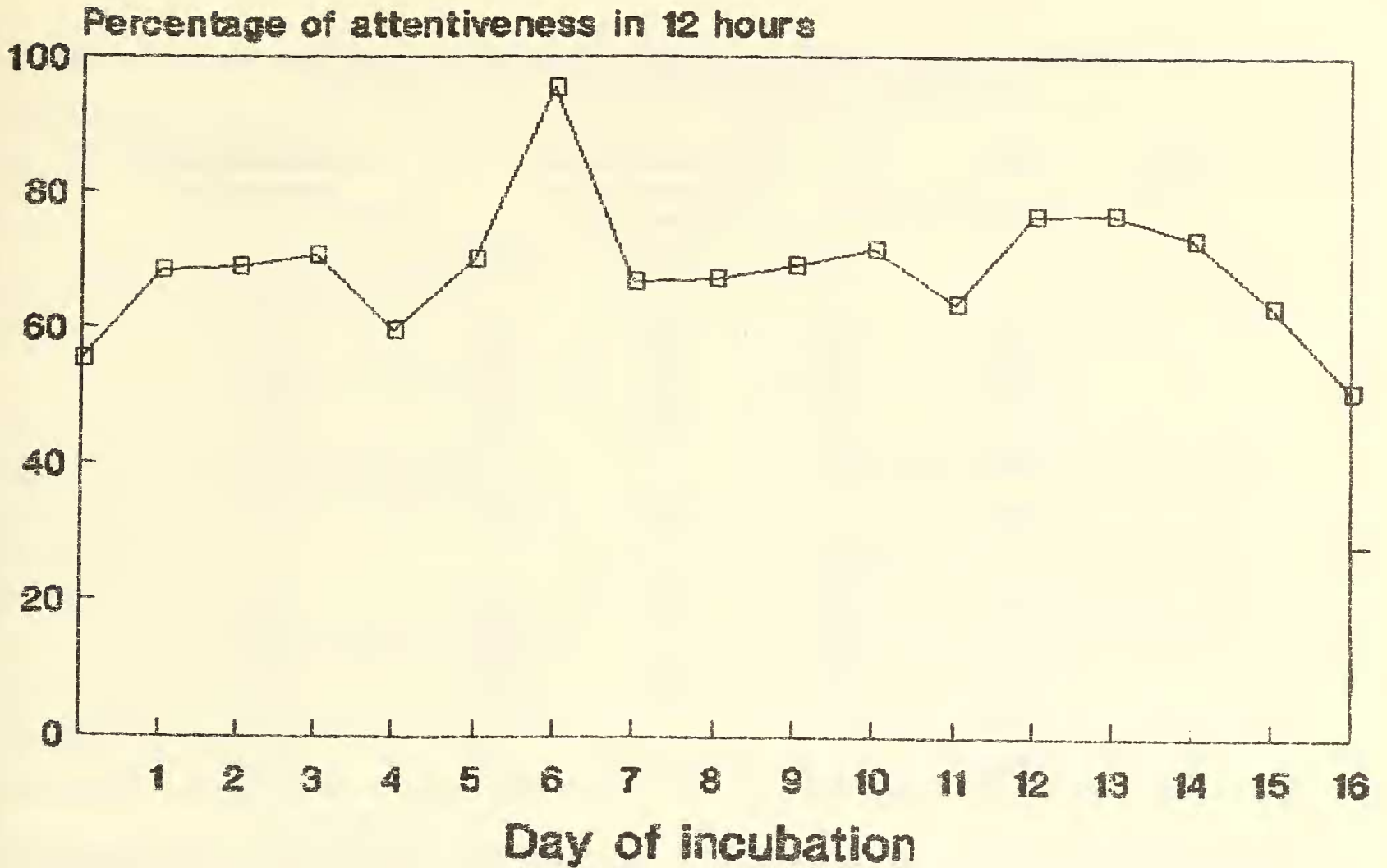


Fig.2 Incubation rhythm

is given in Table 1.

Egg laying, clutch size and incubation

Two nests were observed during egg laying, and in both the cases eggs were laid before completion of the nest. Afterwards the partners mostly engaged in building the dome-like structure of the chamber. Similarly Frith (1975) observed egg

laying before completion of the nest in the Malagasy coucals *Centropus toulou insularis* in Aldabra Atoll. Once a nest with two eggs on the *Pandanus tectorius* bush was deserted due to clearing of the branches of the nesting tree by villagers for fencing. The same pair constructed another nest quite unlike the normal nest, having only a small deep cup-like structure in a nearby *Prosopis chilensis* tree and laid a single egg which successfully reached fledging.

TABLE I
NEST DIMENSIONS (CM) OF THE CROW-PHEASANT

	Length	Breadth	Lengthwise circumference	Breadthwise circumference	Depth	Entrance opening	
						Lengthwise diameter	Breadthwise diameter
No. of nests measured	13	13	14	14	14	12	12
Range	31-45	23-34	79-133	76-110	13-26	9-18	8-18
Mean	37.3	28.4	107.4	91.5	21.4	14.5	14.1
S.D.	5.3	3.4	14.5	9.3	3.4	2.6	2.7

TABLE 2
RATE OF NEST FEEDING DURING DIFFERENT HOURS AND DAYS OF NESTLING PERIOD OF THE CROW-PHEASANT

Nest No.	No. of nestlings	Days	Average per hour visits by the parents between different hours			Average per hour visits for whole day
			6-10	10-14	14-18	
1	4	1 to 4	3.31	2.69	1.94	2.65
		4 to 8	3.88	3.88	3.31	3.69
		8 to 12	6.06	3.81	2.19	4.02
		12 to 16	7.88	7.38	4.81	6.69
		16 to 19	7.63	4.75	4.44	5.60
		Average	5.75	4.50	3.34	4.53
2	2	1 to 4	0.69	0.88	1.19	0.92
		4 to 8	2.38	2.38	1.94	2.23
		8 to 12	3.81	2.50	2.63	3.00
		12 to 16	2.56	2.69	2.06	2.44
		16 to 21	2.44	1.94	2.00	2.13
		Average	2.38	2.08	1.96	2.14

The eggs are oval in shape and chalky white in colour, becoming yellow stained as incubation proceeds. The length of 30 eggs was 34.8 ± 1.8 and the breadth was 28.2 ± 1.2 mm. The mean weight of the fresh eggs was 14.8 ± 1.9 g. According to Baker (1934), the average length of 30 eggs of *Centropus sinensis parroti* was 36.2 and breadth 26.3 mm. The clutch varies from one to four eggs, with a mean clutch size of 2.6 ± 0.75 eggs. The commonest clutch is of three eggs. The daily weight loss in eggs when incubation proceeds was recorded from two nests. The mean weight loss per day during incubation was 0.1036 ± 0.026 g. The incubation period was calculated from the laying of the last egg of a clutch to the hatching of the last nestling (Skutch 1945, Nice 1954) and was 15 to 16 days.

The percentage of nest attentiveness showed variation, except at the end of the incubation period and a drop was noticed before the day of hatching (Fig.2). The overall average attentiveness calculated was 68.7%. In this species both sexes take part in incubation during day time but at

night only one of the partners was observed to incubate/brood. The sex of the partner which attends the nest during night could not be determined.

Regular feeding of the chicks starts after the last egg of the clutch is hatched. During first four days, the parents feed the nestlings by regurgitating the food, especially snails. Both parents feed the nestlings. The number of feeding visits per hour increased till the 16th day and then decreased. The parents visited the nest on an average 4.53 times per hour when there were four nestlings and 2.14 times when there was two nestlings (Table 2).

The removal of egg shell pieces was noticed after hatching, but in some cases unhatched eggs remained in the nest. Both the parents were seen carrying faecal sacs from the nest and dropping them away from the nest site.

Growth of the nestling

The newly hatched (0 day old) nestling was black in colour with eyes closed. Dorsally covered with long white hair-like down feathers named as

TABLE 3
PLUMAGE CHANGES IN CROW-PHEASANT NESTLINGS

Age in days	Plumage	Remarks
1	Body colour dark	Total body length 76mm
2 and 3	Remiges and rectrices feather pins emerge	—
4	Feather pins emerge in alula, upper wing and upper tail coverts	Eyes started opening
5	Spinal, humeral, capita tract pins beginning to emerge	Bill black. Eyes half to three quarters open
6	—	Eyes fully opened
7	Ventral tract had two longitudinal rows of feather pins emerging	Infection by the tick <i>Haemaphysalis intermedia</i> was noticed on the wings
8 to 12	Feather pins of primaries ready to open	Tick infection noticed on dorsal side of the body
13 and 14	Feather pins of few primaries and wing coverts emerge from sheath	Ticks were noticed under tail coverts
15 and 16	All remiges and rectrices feather pins emerge from sheath. Spinal, capital tract pins appear as black brush-like feathers	—
17 and 18	Plumage well developed. Nestlings fledged on 18th day	

'trichoptiles' by Friedmann (1930). These trichoptiles hang forward like a fringe over the eyes and bill, giving the chicks a comical appearance similar to that of black coucal chicks as described by Vernon (1971). The upper mandible was black with pink edges with a small egg-tooth. The centre of the belly was pinkish. The legs and claws were greyish in colour and the plumage changes at different ages (in days) are given in Table 3. The growth of wing, bill, tarsus, tail and the weight change in relation to age is given in Figs. 3 and 4.

Anti-predatory strategies of nestlings

The nestlings were noticed to exhibit a few antipredator mechanisms, namely (a) escaping through the rear end of the nest chamber (b) excretion

of foul smelling, obnoxious sticky fluid and (c) a hissing sound. The hissing of the nestling has been likened to the hiss of a snake. Van Someren (1956) and Vernon (1971), believed it to be an imitation to frighten off predators. These three strategies have also been reported for other coucals (Vincent 1946, Van Someren 1956, Frauca 1967, Steyn 1972 and Frith 1975).

Fledging period

The mean fledging period was 19.7 ± 1.3 days. Fledging normally occurred in the morning. Even after fledging, the young were seen in the same nesting tree for a few more days and later they slowly moved to adjacent trees by hopping along the branches. The parents continued to feed them even

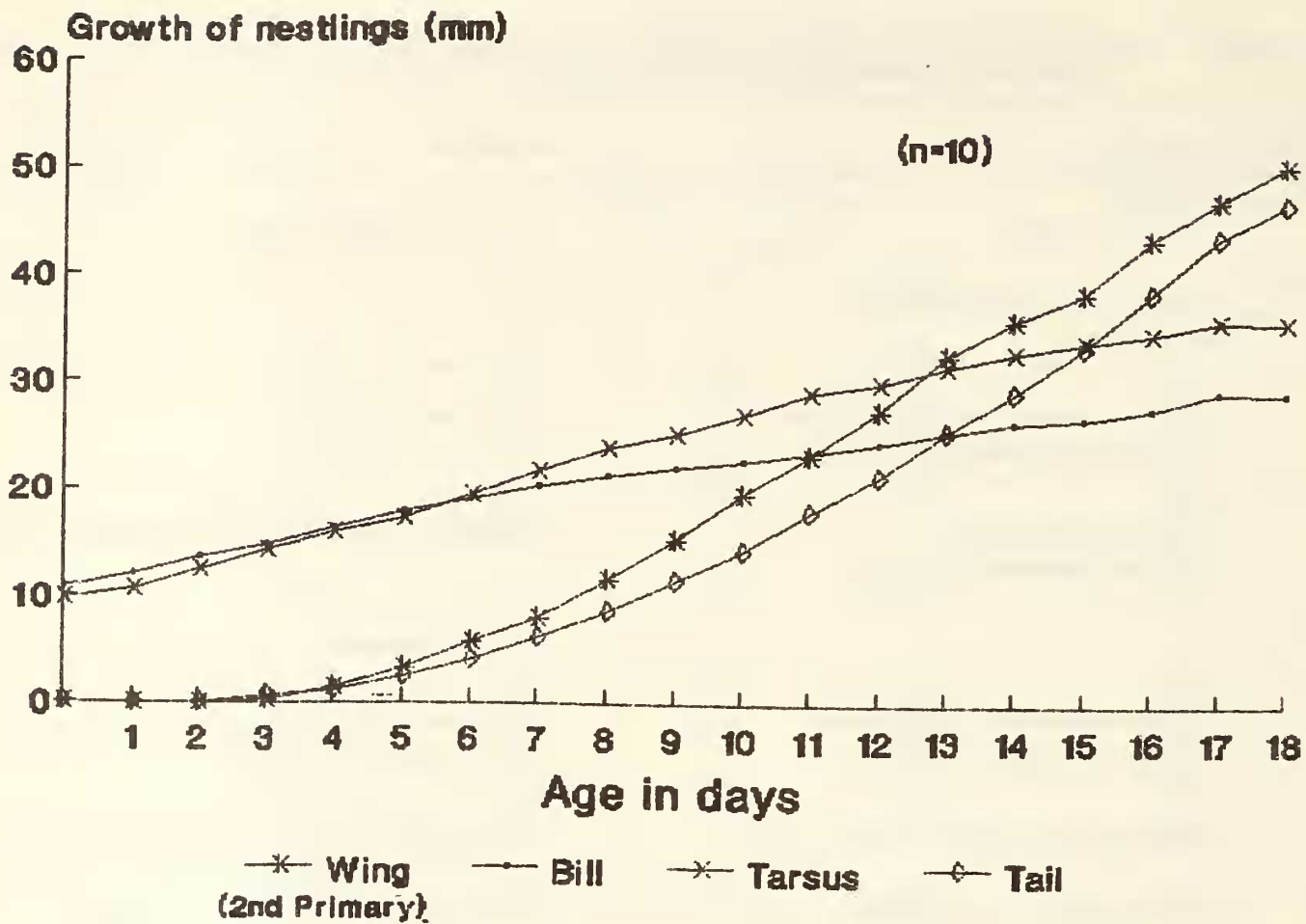


Fig. 3. Mean growth of nestlings

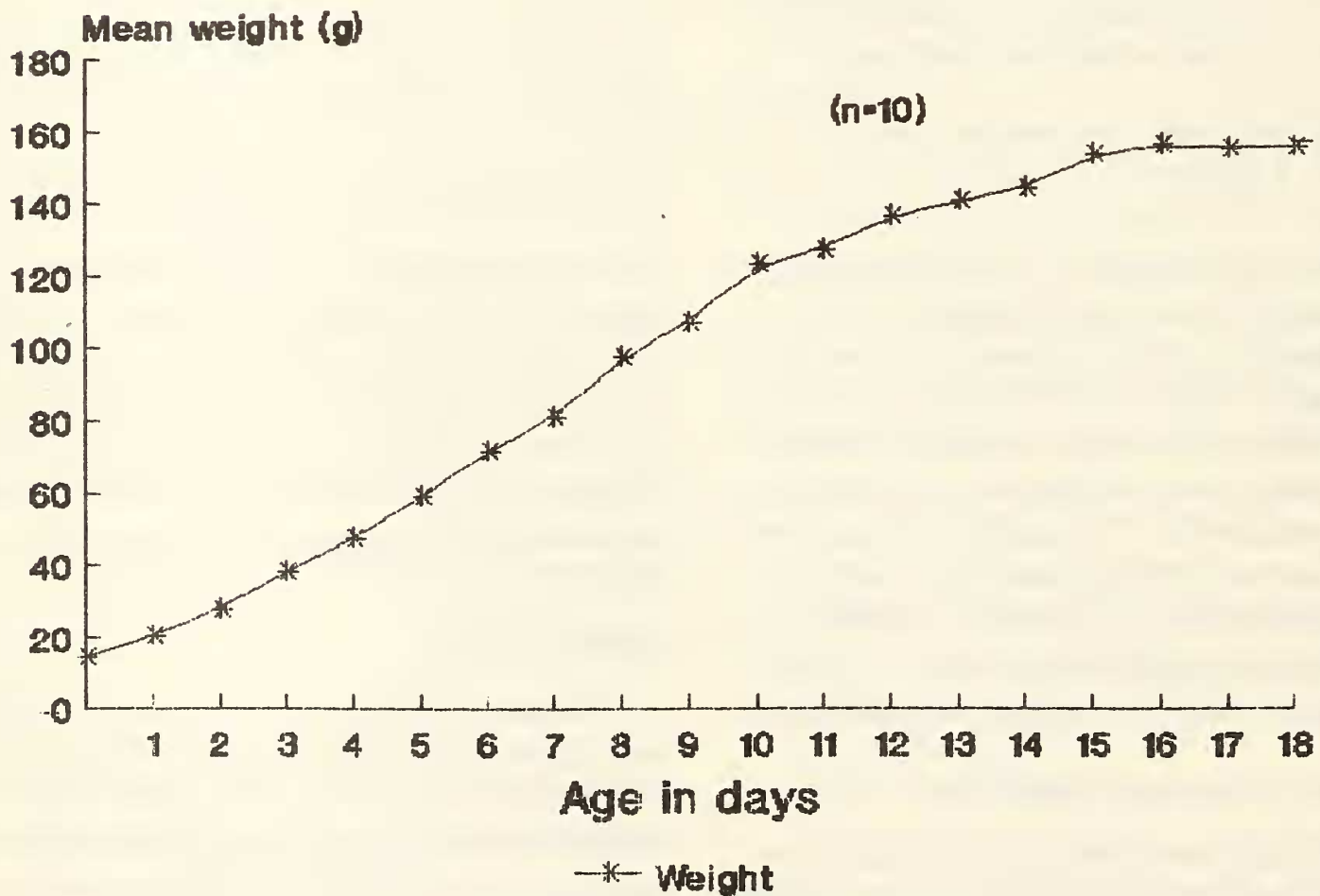


Fig. 4. Weight increase in nestlings

after fledging. Fledged young ones were seen with the parents and were noticed begging for food even two months after fledging.

Dispersal of young

During the study period 30 birds were ringed in the nestling and fledgling stages. Many birds were noticed feeding along with their parents about two months after fledging. After four months a search was made but only two colour banded young birds were noticed, one of which had moved 3 km from its parental territory. The other young one established its territory close to its parental territory. The other tagged birds were not seen in the parental territory. As the rate of predation on young ones was very low at Point Calimere (see below), most of them might have dispersed to other areas far away from their parental territories.

Hatching, fledging and brood success

Out of 21 nests examined from the village site, a total of 54 eggs was recorded out of which 48 eggs were left to hatch (two nests were deserted with a total of five eggs due to habitat destruction and human disturbance). The hatching success, fledging success and the brood success recorded was 77.1%, 97.3%, and 66.7% respectively.

Predation of eggs and nestlings of crow-pheasant was very low at Point Calimere. The crow-pheasant was observed to chase the jungle crow, house crow and brahminy kite and the common mongoose *Herpestes edwardsi* when they came near the nesting sites. However, in one instance an egg of the crow-pheasant was destroyed by a jungle crow as the nest was placed low in a *Prosopis chilensis*

tree and the nest was visible from above. In the second instance, one nestling was attacked and killed by a jungle crow. In this case the nest was placed in a *Cocos nucifera* tree in between the fronds where crows could easily sit and prey upon the young. In the third case a jungle crow was seen to chase an adult crow-pheasant, and attack it while it was entangled in a thorn fence. Later the crow-pheasant managed to escape and flew to a nearby bush.

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